

MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

SRM Number: 3156
MSDS Number: 3156
SRM Name: Tellurium Standard Solution

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MSDS Coordinator: Mario J. Cellarosi
Telephone: 301-975-6776
FAX: 301-926-4751
E-mail: SRMMSDS@nist.gov

Emergency Telephone ChemTrec:
1-800-424-9300 (North America)
+1-703-527-3887 (International)

Description: This Standard Reference Material (SRM) is intended for use as a primary calibration standard for the quantitative determination of tellurium. One unit of SRM 3156 consists of five 10-mL sealed borosilicate glass ampoules of an acidified aqueous solution prepared gravimetrically to contain a known mass fraction of tellurium. The solution contains hydrochloric acid at a volume fraction of approximately 10 %.

Material Name: Tellurium Standard Solution

Other Designations:

Tellurium: Te; elemental tellurium; tellurium metal; metallum problematum; aurum paradoxum.

Tellurium Dichloride: Tellurium (II) chloride; tellurous chloride.

Hydrochloric Acid: Hydrogen chloride; muriatic acid; marine acid.

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component	CAS Registry	EC Number (EINECS)	Concentration (%)
Hydrochloric Acid	7647-01-0	231-595-7	20
Tellurium Dichloride	10025-71-5	(Not found)	1.6
Tellurium	13494-80-9	236-813-4	1

EC Classification, R/S Phrases: Refer to Section 15, Regulatory Information.

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0-4): Health = 3 Fire = 0 Reactivity = 2

Major Health Hazards: Hydrochloric acid can cause severe or fatal burns if inhaled, swallowed, or absorbed through the skin. Exposure to tellurium and its compounds can cause severe lung irritation and other health problems.

Physical Hazards: None documented for this mixture; glass container may break or shatter.

Potential Health Effects

Inhalation:	Inhalation of hydrochloric acid may cause death due to inflammation, spasm, and edema of the larynx and bronchi. Cyanosis, rapid breathing, chemical pneumonitis, and pulmonary edema may occur. Symptoms of exposure include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Tellurium dichloride is highly toxic by inhalation; effects (may be delayed) include coughing, shortness of breath, headache, and a metallic taste in the mouth; high-level exposure may cause pulmonary edema. Absorption of tellurium may cause the breath, sweat, and urine to smell like garlic.
Skin Contact:	Hydrochloric acid can cause severe burns, but it is not absorbed through the skin. Contact with tellurium and its compounds may cause dry, cracked, irritated skin with possible loss of hair. Tellurium dichloride is highly toxic if absorbed through the skin; see effects described for ingestion and inhalation.
Eye Contact:	Hydrochloric acid can cause severe burns and permanent eye damage. Tellurium and its compounds can cause severe eye irritation.
Ingestion:	Hydrochloric acid can cause severe corrosive injury to the mucous membranes and GI tract. Internal bleeding may cause a drop in blood pressure. Other effects may include shock, metabolic acidosis, and circulatory collapse. Ingestion of tellurium and its compounds may cause nausea, vomiting, loss of appetite, and possible damage to the liver, kidneys, and central nervous system.

Medical Conditions Aggravated by Exposure: The mixture and its three components may aggravate pre-existing disorders of the eyes, skin, respiratory tract, or other target organs. Heavy drinkers and smokers may be more susceptible than others.

Listed as a Carcinogen/ Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	_____	<u> X </u>
In the International Agency for Research on Cancer (IARC) Monographs	_____	<u> X </u>
By the Occupational Safety and Health Administration (OSHA)	_____	<u> X </u>

4. FIRST AID MEASURES

Inhalation: Move the person to fresh air immediately. If not breathing, qualified personnel may start CPR or give oxygen if necessary. Get medical aid at once, and bring the container or label.

Skin Contact: Remove contaminated clothing and shoes. Flush affected skin with water for at least 15 minutes, then wash thoroughly with soap and water. If burns are severe or if skin irritation persists, get medical aid and bring the container or label. Wash contaminated clothing before reusing.

Eye Contact: Remove contact lenses (if any). Do not allow victim to rub eyes or keep eyes closed. Flush eyes with large amounts of running water for at least 30 minutes, keeping eyelids open and raising lids to remove all chemical. Get medical aid at once, and bring the container or label.

Ingestion: Contact a poison control center immediately for instructions. Wash out mouth with water, but do not induce vomiting. Get medical aid at once, and bring the container or label.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: No data are available for this mixture, but it is not believed to be a significant fire or explosion hazard. The behavior of the solution may differ from that of the individual components. Hydrochloric acid does not burn, but it may react with water to produce heat; it may also react with metals to produce explosive hydrogen gas. Tellurium metal powder (not present in this mixture) is listed as a pyrophoric metal for shipping purposes. Tellurium burns with a greenish-blue flame.

Extinguishing Media: Use extinguishing media appropriate to the surrounding fire: water spray, dry chemical, carbon dioxide, or foam. A water spray may be used to cool exposed containers to prevent rupture. (These guidelines apply to the mixture; when the components are considered separately, different precautions may apply.)

Fire Fighting: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Flash Point (°C): N/A

Autoignition (°C): N/A

Lower Explosive Limit (LEL): N/A

Upper Explosive Limit (UEL): N/A

Flammability Class (OSHA): N/A

Products of Combustion: Thermal decomposition of hydrochloric acid may release acid halides. Thermal decomposition of tellurium dichloride may release toxic tellurium dioxide and chlorine gas.

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Notify safety personnel of spills. Surfaces contaminated with this material should be covered with slaked lime, soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

Disposal: Refer to Section 13, Disposal Considerations.

7. HANDLING AND STORAGE

Storage: Store unopened containers of this material in a dry place at room temperature. Protect from physical damage, heat, and light, and isolate from incompatible materials. Use opened containers immediately or discard.

Safe Handling Precautions: Wear gloves and chemical safety goggles (Section 8). Engineering controls should maintain airborne concentrations below TLV (Section 8).

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Hydrochloric Acid:

ACGIH TLV-TWA: 5 ppm or 7.6 mg/m³

OSHA TLV-TWA: 5 ppm or 7.6 mg/m³

Tellurium Dichloride:

ACGIH TLV-TWA: 0.1 mg/m³

OSHA TWA-PEL: 0.1mg/m³

Tellurium:

ACGIH TLV-TWA: 0.1 mg/m³

OSHA TWA-PEL: 0.1 mg/m³

Ventilation: Use local or general exhaust to keep employee exposures below limits. Local exhaust ventilation is preferred because it can control contaminant emissions at the source, preventing dispersion into the general work area. Refer to the ACGIH document *Industrial Ventilation, a Manual of Recommended Practices*.

Respirator: If necessary, refer to the NIOSH document *Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84* for selection and use of respirators certified by NIOSH.

Eye Protection: Use chemical safety goggles where dusting or splashing of solutions may occur. See OSHA standard (29 CFR 1910.133) or European Standard EN166. The employer should provide an emergency eye wash fountain and safety shower in the immediate work area.

Personal Protection: Wear appropriate gloves and protective clothing to prevent contact with skin.

9. PHYSICAL AND CHEMICAL PROPERTIES

Hydrochloric Acid	Tellurium Chloride	Tellurium
Appearance and Odor: Colorless liquid; pungent, irritating odor (may be undetectable at PEL).	Appearance and Odor: Greenish-yellow powder	Appearance and Odor: Dark gray, shiny, granular powder
Relative Molecular Weight: 36.46	Relative Molecular Weight: 198.52	Relative Molecular Weight: 127.60
Molecular Formula: HCl	Molecular Formula: TeCl ₂	Molecular Formula: Te
Specific Gravity: 1.05 (10%)	Specific Gravity: 7.05	Specific Gravity: 6.24 (@ 20 °C)
Solvent Solubility: Soluble in alcohol and benzene	Solvent Solubility: Soluble in mineral acid and tartaric acid. Decomposes in NaOH.	Solvent Solubility: Soluble in nitric acid, sulfuric acid, and solutions of potassium hydroxide and potassium cyanide.
Water Solubility: Soluble, with slight evolution of heat	Water Solubility: Decomposes	Water Solubility: Insoluble
Boiling Point (°C): 53 (127 °F)	Boiling Point (°C): 324 (615 °F)	Boiling Point (°C): 988 (1810 °F)
pH: 1.0 (0.1M solution)	pH: N/A	pH: N/A

NOTE: The physical and chemical data provided are for the pure components. No physical or chemical data are available for this solution of tellurium and hydrochloric acid. The actual behavior of the solution may differ from the individual components.

10. STABILITY AND REACTIVITY

Stability: ☒ Stable ☐ Unstable

Stable at normal temperatures and pressure, in mixture form.

Conditions to Avoid: Heat, moisture, incompatible materials.

Incompatible Materials:

Hydrochloric Acid: Incompatible with cyanides, metals, hydroxides, amines, bases, metal cyanides, oxidizing materials, acids, halocarbons, combustible materials, halogens, and metal salts.

Tellurium and Tellurium Chloride: Incompatible with strong acids, strong bases, perchlorates, peroxides, permanganates, halogens, cadmium, chlorine monofluoride, chlorine trifluoride, fluorine, zinc, lithium, silver bromate, potassium, magnesium, and sodium. Lithium silicide attacks tellurium with incandescence.

Fire/Explosion Information: See Section 5.

Hazardous Polymerization: ☐ Will Occur ☒ Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: X Inhalation X Skin X Ingestion

Hydrochloric Acid:

Human, inhalation (LC_{Lo}/30 min): 1300 mg/kg
Human, inhalation (LC_{Lo}/5 min): 3000 mg/kg
Rat, inhalation (LC_{Lo}/24 hrs): 685 mg/m³
Rat, oral (LD₅₀): 700 mg/kg (31.5% in water)

Tellurium Dichloride: No acute toxicity data were found for this compound, but tellurium compounds in general are more toxic than elemental tellurium.

Tellurium:

Rat, oral (LD₅₀): 83 mg/kg
Rat, intratracheal (LD_{Lo}): 200 mg/kg
Dog, subcutaneous (LD_{Lo}): 290 mg/kg

Target Organ(s): Skin, eyes, respiratory tract, GI tract, central nervous system, liver, kidneys.

Mutagen/Teratogen: The reproductive effects of this mixture and its components have not been fully investigated. Tellurium has caused birth defects in animal studies, but only when given at extremely high levels.

Health Effects: See Section 3.

12. ECOLOGICAL INFORMATION

Hydrochloric Acid: When released to water, HCl is ionized. Neutralization depends on the buffer capacity of the water. In the atmosphere, HCl is absorbed in cloud droplets and transformed to Cl⁻, with a half-life of 5.5 days. The solubility of HCl indicates a high mobility in soil. Ecotoxicity data:

Mosquitofish (*Gambusia affinis*), LC₅₀ (96 hrs): 282,000 µg/L
Common Shrimp (*Crangon crangon*), LC₅₀ (48 hrs): 260,000 µg/L

Tellurium Dichloride: No ecotoxicity data found. Tellurium compounds in water or soil may be transformed by microbial methylation and reduction.

Tellurium: No ecotoxicity data found. This element is not known to bioaccumulate.

Environmental Summary: One or more components of this mixture may be toxic to aquatic organisms. Since tellurium is toxic to laboratory animals, it is probably also toxic to fish and wildlife. Do not release this material to the environment.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: One or more components of this mixture is a RCRA hazardous waste. Dispose of container and unused contents in accordance with federal, state, and local requirements for acid waste, which vary according to location. Decontaminate containers before recycling. Processing, use, or contamination of this product may change the waste management options.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Hydrochloric Acid Solution: Hazard Class 8, UN1789, Packing Group II.

15. REGULATORY INFORMATION

U.S. REGULATIONS

CERCLA Sections 102a/103 (40 CFR 302.4):

Hydrochloric Acid: RQ = 5000 lb.
Tellurium Dichloride: Not regulated
Tellurium: Not regulated

SARA Title III Section 302: Not regulated

SARA Title III Section 304: Not regulated

SARA Title III Section 313: Not regulated.

OSHA Process Safety (29 CFR 1910.119): Hydrochloric acid (anhydrous) is regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE:	Yes
CHRONIC:	Yes
FIRE:	No
REACTIVE:	Yes
SUDDEN RELEASE:	No

STATE REGULATIONS

California Proposition 65: No components are regulated.

CANADIAN REGULATIONS

WHMIS Classification:

Hydrochloric Acid: C (oxidizing material), D1A (very toxic material), E (corrosive material)
Tellurium Dichloride: D2A (very toxic material), E (corrosive material)
Tellurium: D2A (very toxic material)

WHMIS Ingredient Disclosure List:

Hydrochloric Acid: Regulated
Tellurium Dichloride: Regulated as Tellurium Compounds, n.o.s.
Tellurium: Regulated as Tellurium, Elemental

CEPA Domestic Substances List (DSL): Hydrochloric acid and tellurium are regulated.

EUROPEAN REGULATIONS

EU/EC Classification:

Hydrochloric Acid: T (Toxic), C (Corrosive)
Tellurium Dichloride: E (Corrosive), T (Toxic); not found in ESIS database.
Tellurium: T (Toxic); not classified in Annex I of Directive 67/548/EEC; not on a priority list.

Risk Phrases (mixture):

R23 (toxic by inhalation)
R25 (toxic if swallowed)
R34 (causes burns)
R36/37/38 (irritating to eyes, respiratory system and skin)

Safety Phrases (mixture):

S20/21 (when using, do not eat, drink or smoke)
S28 (wash after contact with skin)
S45 (in case of accident or illness, see doctor; show label)
S60 (dispose of this material and its container as hazardous waste)

NATIONAL INVENTORY STATUS

U.S. Inventory (TSCA): Hydrochloric acid and tellurium are listed.

TSCA 12(b), Export Notification: No components are listed.

16. OTHER INFORMATION

Sources:

Hazardous Substances Data Bank (HSDB): Tellurium, Elemental.

Hazardous Substances Data Bank (HSDB): Tellurium Compounds.

IUCLID Chemical Data Sheet: Hydrogen Chloride. European Chemicals Bureau, 19 February 2000.

New Jersey Department of Health, Hazardous Substance Fact Sheet: Tellurium. November 1999.

U.S. National Institute for Occupational Safety and Health, *NIOSH Pocket Guide to Chemical Hazards*, June 1990 edition. DHHS (NIOSH) Publication No. 90-117.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.